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Title: The view from below: ‘lock in’ and local procurement in the African gold mining sector

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Abstract:

Through linkage creation, commodity extraction has the capacity to support local industrial production and capabilities building. Drawing on the experience of supplying inputs into the East African gold mining industry, this paper examines the constraints experienced by local suppliers arising from the purchasing procedures of large mining corporations and specialist construction companies contracted to construct these mines. Lead firms become locked-in to particular ways of working which minimise the opportunities that local suppliers have in providing products and services. After reviewing the situation for local mining suppliers in East Africa, the paper examines ways lead firms, the suppliers themselves and others (governments and industry associations) can better support local supplier involvement.

Keywords: gold mining, value chains, supply chains, linkages, East Africa, local procurement

The view from below: 'lock in' and local procurement in the African gold mining sector

1. Introduction

In Tanzania mining was estimated in 2010 to contribute 40% of exports, with the value of exports from mining rising from 26 million US\$ in 1990 to 1,114 million US\$ in 2010 (UNESCO, 2011). Large scale formal sector mining was estimated to have contributed 3.3% of GDP and have raised local employment in the formal mining sector from 1,700 to 14,000 (ibid). In the Democratic Republic of Congo (DRC) mining is expected to contribute 50% of GDP by 2015 (Reuters, 25 October 2010) up from 23-25% in 2010. A World Bank report (2008) estimated mining was contributing 70-80% of export earnings for DRC but only 8% of GDP. Despite the expressed desire of both government and the private sector to promote linkages from gold mining, these linkages are sparse (see Mjimba, 2012 for the case of Tanzania), particularly with regard to the participation of locally owned suppliers.

This paper investigates the impact of mining company operations from below asking 'what is life like for local suppliers within an East African mining value chain?' It builds on the observations of one of the authors as an East African mining industry 'insider' and 'reflective practitioner' (Schön, 1991) while working for the past 15 years in firms supplying construction and plant related machinery and services to the lead mining firms operating in the region. Analysis within this paper of these observations provides an opportunity to question the existing state of play with regards to linkage development (particularly in relation to backward linkages) within the East African mining sector.

Hirschman (1981) acknowledged the relevance of linkage building as an economic tool to facilitate growth. Others have taken up the argument that linkages are an opportunity for governments to improve employment opportunities, diversify the economic base of a country in terms of its export potential and development of dynamic capabilities within firms and industries (Morris et al, 2011a). However, little research exists using grounded data, especially in low income environments. Building on qualitative data collected from mining company supply firms, this paper discusses factors that have impacted on linkage development within the supply chain to gold mines in East Africa. In particular, it discusses the role that lead firms play in 'locking in' supply chain decisions, drawing on value chain theories of governance, the organisational management literature relating to theories of 'lock-in' and aspects of the supply chain management literature.

The paper begins with the contextual background to the gold mining sector and the literature on linkages for economic diversification and growth (Section 2). This section also provides an overview of data sources. In Section 3, the paper outlines the procurement practice in four East African gold mines. Section 4 discusses the findings within the wider policy and industrial context drawing on the above-mentioned literatures to help explain these trends. This includes recommendations on how to effectively support local businesses in promoting their position within the gold mining supply chains of East Africa. The conclusion considers the wider and policy implications of this analysis.

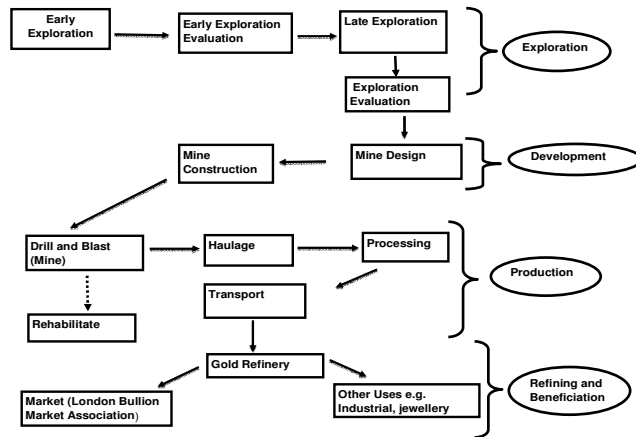
2. Context and theory

The mining sector is widely considered to be an enclave industry with limited backward linkages (Prebisch, 1950; Singer, 1950). However, current thinking has been changing with increasing acknowledgement that mining can lead to both the emergence of downstream local industrial production and the creation of capabilities; even the opportunity for a ‘collective learning experience’ (World Bank, 2002). These opportunities are determined by the depth (degree of value added created) and breadth (the range of inputs or outputs utilised) of linkages that are created between firms and individuals within and between sectors (Morris et al, 2011a). This success however is dependent on recognition by policy makers and practitioners of two important determining conditions. First, it requires a receptive enabling environment both in terms of facilitatory government policy (World Bank, 2002; Mjimba, 2011) and facilitatory lead firms and suppliers (Morris et al, 2011b). Second, the nature and degree of linkages reflect the power relations in value chains (Gereffi et al, 2005). The mining sector is made up of numerous actors who all participate in a range of activities to bring a particular product or service from initialisation to production and delivery to the final consumer. The combination of these actors and activities to create a particular product or service is termed a ‘value chain’ which in every sector are becoming increasingly global in nature. The coordination of these chains, the architecture of supplier development and the distributional outcomes of production are determined by the nature of chain governance.

Figure 1 presents a synoptic picture of the gold mining value chain, distinguishing four sub-chains – exploration, construction, production and processing. In this paper we explore the determination of

backward linkages in the construction and production sub-chains and the interconnections between the determinants of linkages in these two sub-chains.

Figure 1: the global gold mining value chain



Source: Mjimba, 2012

At the same time as there has been growing recognition of the importance of backward linkages in the academic world, there has been a similar recognition within the practitioner sector also. Firms have recognised the need to support and nurture backward linkages to enable a more efficient supply chain or production process through outsourcing activities in a range of industries including the automotive sector (Parry and Roehrich, 2009), semi-conductors (Bessant et al, 2003) and pharmaceuticals (Tait and Mittra, 2004). A similar process of outsourcing is also underway in the gold mining sector. Major mining companies operating inter alia, in South Africa (Kaplan, 2011), Ghana (Bloch and Owusu, 2011), Tanzania (Mjimba, 2011) and the DRC (Hanlin, 2011) have all targeted an increase in local inputs as components of their efficiency drives and/or as part of corporate social responsibility activities (Morris et al, 2011b).

So what does this mean in practice for the local supplier? Utilizing on-going experience of providing inputs into the gold mining sectors in Tanzania and the DRC, this paper examines the way in which lead mining firms and their first-tier suppliers determine the success or otherwise of the creation, operation and stability of backward linkages. Clearly, time is a major factor in determining the successful development of backward linkages and that in this respect the East African gold mining sector is relatively undeveloped (although the mining industry as a whole is not), particularly in the DRC which also has the added complication of being a post-conflict state where graft is rife (World Bank, 2008). Nevertheless, the youthful age of the East African mining sector is not in itself the

determining factor in linkage development. As will be shown, firm-specific strategies have an important bearing on the outcome.

This paper is based on case study material built up following a process of 'reflecting on action' (Schön, 1991). Involvement by the second author as a private sector actor in a multi-stakeholder research programme focusing on nature and determinants of linkages in Africa's resource sector (see <http://commodities.open.ac.uk>), was the spur to this process of 'reflecting on action' over a two year period (2009-2011). This required the second author to consider his own activities, and that of the sector as a whole, in a way he had not previously done before; to take a step back and consider the enabling and constraining factors impacting his current and previous companies' successes in supplying lead firms and their contractors and sub-contractors with a variety of services and products from drills and welding electrodes to air charter and road haulage services to all of the gold mines in Tanzania and DRC. In so doing, the author became an insider participant observer (Labaree, 2002), and as in all action research, this unavoidably both provides the opportunity for rich data generation and raises the danger of data-bias. Attempts were systematically made to triangulate individual experience by seeking the views of other suppliers into the gold mining sector, lead mining firms and through interaction with academic researchers (notably Mjimba, 2011 and Bloch and Owusu, 2011) and public sector stakeholders in the research programme.

Recognising the sensitivities of firms within the sector, the names of firms have been removed and care taken to ensure anonymity is retained as much as possible in what is still a small sector. We have therefore distinguished firms by letter - A, B, C, all operating in Tanzania, and D in the DRC - rather than their real names. We have also tried to avoid using geographical locators.

3. The view from the bottom: life in the supply chain

This paper will show how the industry has developed mechanisms that determine key aspects of the procurement process and supply chain and in so doing reinforce the dominance of lead firms. To illustrate this point, we will introduce a series of constraints experienced by the second author during his time as an action researcher between 2009 and 2011. They specifically relate to three gold mines in Tanzania and one in the DRC. These mines have been chosen to illustrate this point because of their differing procedures on local procurement.

Mines A and B are run by the same lead firm which has a long history of mining operations. Mine A is a longer-established gold mine in Tanzania than Mine B. The company running these two mines undertakes to engage in local procurement and claims that almost half of all procurement is locally sourced. However, in reporting the performance of local procurement there is no clear cut definition of what conforms to local procurement. If, for example, spare parts are procured through local dealerships of large multinational plant suppliers (Komatsu, Caterpillar, etc.) this is deemed as local procurement – even though this means little local value addition.

Mine C is a relatively new Tanzanian gold mine. The mining company that runs it has a clearly-stated policy of maximising local procurement and has in the past actively encouraged their procurement officers to engage with local suppliers and explore the opportunities offered by local markets

We begin with the experience of local suppliers before we seek to place these findings in a wider framework. The key constraints experienced by suppliers are outlined in Table 3 and reflect a pattern of complicated and centralised systems of procurement which present major hurdles to suppliers in the context of weak local capabilities. A particular problem is the pattern of human resource and personnel management in the lead mining firms, a factor which is generally of unrecognised importance in linkage development in the mining sector (Morris et al, 2011b). Even when a procurement function is located on the operational mine site the procurement offices, often expatriate-led, may have little interaction with the local economy preferring to use existing corporate procurement structures and, in so doing, have the effect of bypassing local potential.

Table 1: Constraints for local suppliers to Mines A, B and C

Complicated and centralised systems impractical to the local environment	
Global contracts	Suppliers in Mines A, B and C complained that many procurement decisions relate to global contracts determined in the mining company's headquarters effectively excluding Tanzanian suppliers.
Graft	Claims of graft and impropriety within the procurement department of Mine C were reported. There was a general feeling amongst suppliers that a transparent and free procurement process was missing, creating a closed market not accessible to most local suppliers.
Unsustainability	Suppliers have been assisted to produce products for Mines A and B at discounted rates that are often uncompetitive in the open market, leading to extreme dependence on the mine. This created a feeling of insecurity

	amongst suppliers.
Timescales	<p>In Mines A, B and C invoice payments by the mining firm and its main contractors often took longer than 60 days in a context of high inflation rates arising from cumbersome internal payment approval processes.</p> <p>Conversely, local suppliers to all three mines were expected to supply quickly on receipt of a purchase order despite poor Tanzanian physical infrastructure.</p>
Personnel and HR decisions	
Physical separation	Mine C was physically isolated from nearby urban environments making it difficult for local suppliers to interact with the procurement officials. Many of Tanzania's mines have limited transport links and suppliers often have to depend on the mine's internal transport system to visit the mines (on shuttle buses or charter flights).
Staff turnover	<p>High staff turnover in Mine C's procurement department between 2009 and 2012 led to inconsistencies in procurement decision making. For example, suppliers who customarily received requisition orders found that these requisition orders were also offered to their competitors.</p> <p>In addition, the use of expatriate procurement officers in Mines A, B and C who often worked eight week on/ two week off rotations, resulted in procurement officers not being able to develop long term relationships with local Tanzanian suppliers.</p>
Performance systems	The performance of purchasing personnel in mining operations is monitored by their ability to deliver, within budget and within agreed time scales. Procurement officers reported that moving to new local suppliers was a move into the unknown with potentially negative effects on performance.
Expectations	Expatriate procurement officers often experienced levels of service that did not meet their expectations. As a result, expatriate procurement officers tended to avoid engaging in local markets reverting to markets they understood, felt comfortable with, and knew would deliver.

Despite these many constraints within the procurement process of some of Tanzania's gold mines, local procurement did occur at the margin, particularly with regards to a new gold mine (Mine D) recently set up in the DRC. Although many local suppliers to Mine D faced many of the human resource issues listed in Table 3, the company managing Mine D had set up a new procurement

office to oversee and regulate activities. The company was proactive in gathering intelligence on the capabilities of local and regional suppliers in an attempt to maximise local procurement. Although a large percentage of all procurements were nevertheless sourced from outside the local market and often from the home markets of procurement officers, particularly by the company's construction contractors, there was evidence that the company was actively encouraging and supporting its procurement officers to engage with local suppliers and explore the opportunities offered by local markets. For example, Mine D's catering supplier sources 100 per cent of its fresh produce from local DRC producers, an achievement not attained by the much longer-lived Tanzanian mines operating with similar local supply constraints. Mines D's procurement officers travelled widely through the region to assess the availability and quality of products needed during the mine's operation.

These observed constraints to local procurement are much greater during the design and development phases of the mine, before procurement departments have been established in most mines. Moreover, the procurement decisions made in the design and construction phases are heavily influenced by the lead mining firm or 'the client' – the corporation in possession of the mining license. In general, standards are set in these phases designed to minimise risk-exposure by ensuring that the mine design is proven with an ability to produce to known productivity targets to be in line with the client's other mining operations. Standardisation has a direct impact on procurement generally requiring specific global suppliers. Decisions in respect to specification are often made by the design team or main construction contractor based upon precedent, rather than on an understanding of available local expertise or manufacturing capacities of local and regional businesses. This not only reduces the role played by local suppliers of capital goods, but also effectively excludes local suppliers from subsequent maintenance and spares requirements that will develop over the lifecycle of the mine.

Where local sub-contractors are engaged by the main contractor the level of revenue generation for the local economy is further limited by the contract type awarded to the sub-contractor and the standard specification. The contract type determines whether or not the sub-contractor has any decision making powers within the materials procurement process, while the standard specification for the project effectively limits where materials can be procured. If, for example, as occurred in Mine B, Australian standards were specified by a main contractor (from Australia), then virtually every component used in construction had to conform to Australian standards and be certified as such. This standard effectively limited local procurement to very basic incidental items and forced

sub-contractors to procure from suppliers able to deliver Australian standard certifications. This also affected on-going procurement. For example in the case under discussion, all plugs and electrical sockets had to be procured to this Australian standard throughout the lifecycle of the mine, excluding local suppliers who were able to produce equivalent products which met the UK standards which were widely used in Tanzania.

Another example of this lock-in between design and operation phases arises as a consequence of the systems used to staff mines during mine construction, and specifically with regard to accommodation blocks and messing facilities. The construction contractor tends to appoint international companies who they know have a track record of delivery in similar environments as they cannot afford the risk of systems failures for critical services as they could jeopardise the outcome of the contract they have been awarded. There is a prevailing tendency for these contracts, entered into with the main contractor and for the duration of the construction phase only, to be extended by the client for the operation phase. Simply put, once an international contractor is on location, and delivering catering or another service to the required service standard, it is far simpler for the mine operator to maintain this contractor than to move to another one.

Just as operational mine welfare requirements are often pre-determined, so too are many consumables contracts. The value of contracts to supply plant, fuels, lubricants, chemicals is considerable. Due to their critical nature and the high value of the contracts that are awarded, responsibility for such procurement often does not lie with the mine but rather with its global head office; who procure these goods and services globally. The best that local economies can hope for in such situations is that the volume of business generated by mining operations is significant enough to merit the establishment of in-country branch offices for these global suppliers (e.g. the Komatsu or other plant dealerships discussed earlier). But, in turn, these large first-tier suppliers are characteristically driven by the same global-sourcing strategies of the lead mines, further precluding the opportunity for locally sourced inputs from second and third tier suppliers.

In summary, we can see from the above that many of the procurement decisions taken on an operational mine are pre-determined either in the design or construction phase without reference to local context and through global corporate procurement contracts. Despite this, there are still opportunities for local businesses to engage with the large mining operations, and to develop successful linkages as we shall now discuss.

4. Lock-in: The wider significance of this specific experience

The notion of lock-in is a key concept within organisational management theory (see Arthur, 1989; Liebowitz and Maglois, 1995) used to explain why some firms are unable to move to keep up with competitors. Events in the past mean they find it difficult “to switch strategies because of sunk costs and established market position” (Dobbin and Braum, 2000). They become bounded by their knowledge and context (Simon, 1972) and are set on particular trajectories (Dosi, 1982). Section 3 provided examples of this in lead mining firms in Tanzania. However, it also provided an example of a new entrant to the mining value chain which had succeeded in developing greater local linkages. This arose as a consequence both of individual corporate strategy and because the new mine was less hampered by its historical trajectory. The company running Mine D is a relatively new player in the mining sector and this is its first production facility. As such it has no established procedures to adhere to. Henderson and Clark (1990: 17) talk of the need for firms to move their activities from one of “refinement within a stable architecture to one of active research for new solutions within a constantly changing environment”. They argue (as do others in the context of routines; see Levitt and March, 1988) that firms are often drawn into one particular set of ‘architectural knowledge’ or ways of doing things that makes it difficult for them to then change in a way others can, particularly new entrants, to respond to changes such as those required by consumers demands or government decisions.

The decision at different points in the lifecycle of a mine to introduce particular sets of technical standards are opportunities for lead firms to control who is inside and who remains outside the value chain (Lee et al, 2010; Kaplinsky, 2010). Section 3 showed that some of these decisions may have been made ‘unconsciously’ as part of the “normal operating procedures” of the lead mining firm. Mine B’s decision to use Australian standards is a case in point, but it arose indirectly, that is not as decision of the lead mine firm, but as a consequence of its choice of a construction contractor. A study reviewing the history of the UK’s construction industry (Cacciatori and Jacobides, 2005) highlights the impact that the type of contract used in Mine B’s case (Design and Build) had on increasing the vertical integration within the industry due to the fact that these contract gave power of decision making to one key player. Therefore in this instance the lead firm changes from the mining firm to the construction contractor overseeing the project.

The area of standards however is also an opportunity where a concerned lead firm can act proactively to promote local supplier development. Despite the many cases of where standards excluded opportunities for local suppliers from working with the main contractor in Mine B during the construction process, this did start to change. The high-density polyethylene (HDPE) pipes (rated to three different pressures) needed for Mine B's construction were initially ordered from Australian production facilities. However, the original shipment of pipes from Australia was not sufficient. A Tanzanian sub-contractor who was fitting the pipes informed Mine B that two types of pipe which met the functional demands of the mine were available from a Tanzanian manufacturer and that they had the capability to change their production line to produce the third if the order was of sufficient quantity to warrant the change in production processes. The final order for additional piping was redirected to this local supplier.

Beyond the existing capabilities of local suppliers is the role which lead firms and other parties (such as governments and industry associations) can play in supplier development. The literature on supplier development highlights efforts being made in a range of areas by multi-national companies (MNCs) (see for example Jenkins et al, 2007) as well as specifically in the commodities sector (see Engineers Against Poverty, 2007; Esteves et al, 2009). As in the pipe example above this literature highlights the key role lead firms have in supporting supplier development. This literature relating to the resource sector invariably highlight the role played by MNCs lead firms but as we have seen it is often the first-tier MNC supplier firms who are most closely involved in potential second and third tier local supplier development. Whoever is closest to the cutting edge of local supplier development, there is a need for strong visions by company directors and boards that proactively encourage local content which is filtered down and introduced throughout all levels of an organisation. Several examples of lead firms acting as potential change agents are visible in our case studies. The mining firms running Mine C and D have both actively encouraged their procurement officers to engage with local suppliers with Mine D being particularly active in this regard. These supplier development programmes not only create the potential for local suppliers to learn, but also to contribute to the development of procurement systems. Moreover they also provide the opportunity for negotiations to take place in respect of time scales for delivery of goods and between invoicing and payment which (as we saw in Table 1 above) are a major constraint to the development of local supplier capabilities.

Evidence shows however that even where dedicated supplier development activity takes place it takes a long time and requires serious commitment on the part of lead firms and all the suppliers

down the value chain (not just the first tier suppliers but also their suppliers of component parts) (Bessant et al, 2003). As such it requires the development of long term relationships (Krause et al, 2007). The experience of the Tanzanian gold mining industry shows a relative absence of this commitment to long-term trust-intensive efforts by lead firms.

The final issue raised by the case studies is that of risk aversion and its link to the issue of personnel and human resource policy. The nature of staffing contracts means that procurement officers, particularly expatriate staff, are unable to gain in-depth knowledge of their local working environment. They often distrust local supply potential or are not incentivised to utilise local suppliers due to the risk averse nature of the time scales and performance management mechanisms. One way to overcome this is through the development of shared goals and culture (Inkpen and Tsang, 2005). However, this is only possible with recognition of this from others within the lead firm and other actors within the value chain, including suppliers, who have to be willing to engage with the mining companies themselves should they have the capacity to do so. Therefore on both sides of the relationship there is a need to “challenge inherited mindsets” (Morris et al, 2006: 549). This brings us back to our earlier discussion of the routines within firms - often tacit and implicit – and what is seen to be ‘normal’ to the operations.

4.2 What can suppliers and others do?

So far we have only dealt with the impact that lead firms (and so some extent first tier suppliers) can have on developing supplier networks. However, second and third tier suppliers do not have to be passive actors in the value chain (Kaplinsky and Morris, 2002). Most of the literature on supply chains and organisational management takes the lead firm as the dominant actor in the value or supply chain. However, there are examples of suppliers pro-actively influencing and inserting themselves into value chains. In addition, governments can also play a key role, along with industry organisations in assisting local suppliers in this process.

This is important when conventional literature (particularly transaction cost economics) and business practice would support the current practices of the lead mining firms and their construction contractors which is to promote the most efficient and cost-effective existing supply base. This means maintaining the linkages with existing supplies predominately in countries external to where the mines are situated since the cost of switching would be too high in situations of existing path dependence. The evidence provided in this paper highlights that this is not simply a matter of firm

level business strategy but also the result of the actions of individual procurement officers having to act often in unfamiliar settings.

This paper advocates the role that suppliers themselves can have in changing the status quo with regards backward linkages and 'lock-in'. For example, we provide an example of the potential role that an incumbent local supplier can have as a change agent. An existing local construction sub-contractor provided information that enabled the procurement office of Mine B to utilise the products of a local pipe manufacturer. The mine procurement department had never considered using locally sourced HDPE pipes before. (This example also accords with an argument proposed by Bessant et al (2003) that best practice lead firms in value chains seek not only to improve the capabilities of their suppliers, but also to learn from them).

It is likely that without the incumbent local construction sub-contractor being on site at Mine B already, the local pipe supplier would never have been engaged. Therefore, the question remains, *how does a local indigenous supplier insert itself into a value chain?* Even in a situation where there is an open tender process, which the local supplier is aware of and can produce a bid of competitive standard to other foreign suppliers, the risk aversion strategies of individual procurement officers and the lead firm as a whole may still win out. Industry associations have a role to play in promoting business opportunities of local suppliers. For example, the Institute of Engineers Tanzania (with assistance from Engineers Against Poverty and the International Labour Office) has been working with construction companies to upgrade their health and safety standards enabling companies to now tender for international contracts requiring health, safety and environment standards consistent with internationally acknowledged standards.

Governments also have a role to promote local supplier insertion into value chains. Cattaneo et al (2010) highlight a range of government incentive schemes around the world that have been developed to promote local suppliers within the apparel global value chain. These range from provision of free cotton seed in India to tax rebates for Chinese clothing manufacturers to a range of multi-country and regional trade agreements. Morris et al. (2006) show how in South Africa, Durban's Metropolitan Council actively supported the creation of an automotive cluster in order to supply Toyota with car components. In Ghana, the government implements a requirement on local content with regards personnel while the government and the Ghana Chamber of Mines have worked together to develop a local business programme (Bloch and Owusu, 2011).

Even where support is provided by governments and industry associations, there is often an argument to be made that suppliers are not ready; that they don't have the capacity to supply the quantity or the quality of product or service needed (Mjimba, 2011). This may indeed be the case in some instances. However, just as lead firms need to keep adapting and work to avoid being locked-in to old markets and ways of working, so too do local suppliers need to continue working to be locked-into these chains, as in the case of the pipe supplier which moved into new product lines.

5. Conclusion

This paper has outlined, using data from action research, what life is like for a local supplier in the East African gold mining value chain. It has put this within the context of existing academic literature to show that in East Africa this is a young and capital intensive sector with a lack of capabilities on the part of both local suppliers (to manage the demands of lead firms and specialist construction contractors) and lead firms (in understanding the environment in which they are working). Despite this, our analysis shows that there is the potential to deepen linkages but often these are hampered by a range of factors currently not adequately addressed by the academic literature on supply chains or value chains but can be supported by some of the organisational and innovation management literature.

Specifically, our analysis leads us to four main conclusions and also avenues for further research. This paper through the use of insider reflection highlights the usefulness of alternative types of data, where carefully validated for bias, both as a source of triangulated data and as a mechanism for filling the vacuum of empirical data on supplier dynamics. However, further in-depth analysis of the issues raised by this paper is required and these build on the main conclusions as expanded on below.

First, lock-in is a key issue impacting the ability of local suppliers in Tanzania and DRC to insert themselves into the gold mining value chain due to the interconnectedness of sourcing decisions throughout the lifecycle of a mine. However, prevailing business practice of the mining firms and some of the academic literature (notably transaction cost economics) would promote the continuation of the East African mining firms' supply chain practice. The evidence presented in this paper hints at the prospect that mining firms are 'missing a trick' by not promoting more local supplier development. Further research is needed however to properly assess the extent of this. Key questions raised by this for further empirical research include: Are mining companies acting inefficiently by maximising short-term efficiency at the cost of long-term efficiency? If not, how

much profit and shareholder value are they willing to sacrifice to support the benefit of local businesses and promotion of local community and host country economic development? Can the features of a pro-active lead firm be identified and what value do these have for the industry as a whole?

Second, most of the literature on lock-in acknowledges the role of lead firms but our analysis highlights the importance of specialist construction contractors and the outsourcing of activities to them. This creates an additional level of lock-in to not only any standards of lead mining firms but also the routines of their construction contractors. As a result, there is a need for more study of the impact of these first tier suppliers in locking in procurement processes to certain practices.

Third, our study highlights the role of certain key individuals within lead mining firms and their construction contractors; the expatriate procurement officer. We have not found literature which adequately addresses this issue. Existing literature appears predominately based on what happens in European, North American and Asian environments where procurement officers are not subject to the same hostile and unfamiliar distant business environments. Moreover, the bulk of this literature focuses on structures of supply chain management rather than the attitudes and actions of individual supply chain managers and the incentive system in which they operate. A multi-site and multi-country ethnographic study of procurement officers' individual activity and how it supports or operates differently to corporate strategy would be one way to address this gap.

Finally, as outlined above, a set of supply chain literature focusing on local supplier development in developing country contexts does support the evidence that there is a role for local Tanzanian and DRC based suppliers to pro-actively subvert the 'lock-in' process. More in-depth case study research is required to analyse whether there are any activities local suppliers to the East African mining sector are conducting which would have relevance in other sectors in the region and what role government or industry incentives (positive and negative) have on their successful implementation. We would posit that this paper has generalizability across other sectors in terms of the suggested mechanisms by which local suppliers can try to subvert the dominance of lead firms. The actions of working collectively together, as highlighted above, through industry associations and independently have worked for suppliers in other chains in other sectors and there is a small amount of evidence to show this is working in Tanzania and DRC also.

Ultimately however although successful linkage and local supplier development is recognised by some of the academic literature and by a few firms working in the mining sector as efficiency promoting, these require relationship building where trust is a key element for success. This takes time and effort. This is acknowledged within the innovation and much of the project management literature but is, as the Tanzanian and DRC examples in this paper highlight, very difficult to achieve in practice.

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